COHERENT PRODUCT INCLUDING PARTIALLY SEPARATED PLASTIC OPPOSING WALL-SECTION COMPONENTS

CROSS-REFERENCE TO RELATED APPLICATION

For the United States of America only, this is a continuation-in-part of United States Provisional Patent Application No. 60/440,227 filed January 14, 2003.

BACKGROUND

The present invention generally pertains to wall sections of coherent products having opposing plastic wall components and is particularly directed to improvements in plastic products, such as cups and food containers that include thin-wall sections.

SUMMARY OF THE INVENTION

The present invention provides a coherent product including a wall section, wherein the wall section comprises: a first plastic wall component that is injection molded and includes two or more ribs and a web therebetween; and an opposing second plastic wall component; wherein at least a portion of the ribs of the first wall component directly or indirectly contact the second wall component, and at least a portion of the web of the first wall component is apart from the second wall component.

The present invention further provides a coherent product including a wall section, wherein the wall section comprises: a first plastic wall component that is injection molded and includes two or more ribs and a web therebetween; and an opposing second plastic wall component that is injection molded and includes two or more ribs and a web therebetween; wherein at least a portion of the ribs of one said wall component directly or indirectly contact the other said wall component, and at least a portion of the

web of the one said wall component is apart from the web of the other said wall component.

The present invention thereby enhances the stiffness-to-weight ratio of a wall section having a given thickness.

The present invention also provides cups and other containers, such as food containers having such wall sections.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a sectional view of a first embodiment of a wall section according to the present invention.

FIG. 2 is a sectional view of a second embodiment of a wall section according to the present invention.

FIG. 3 is a sectional view of a third embodiment of a wall section according to the present invention.

FIG. 4 is a sectional view of a fourth embodiment of a wall section according to the present invention.

FIG. 5 is a sectional view of a fifth embodiment of a wall section according to the present invention.

FIG. 6 is a sectional view of a sixth embodiment of a wall section according to the present invention.

FIG. 6A is a sectional view of a preferred variation of the wall section embodiments shown in FIGS. 4, 5 and 6.

FIG. 7 is a sectional view of a seventh embodiment of a wall section according to the present invention.

FIG. 8 is a sectional view of an eighth embodiment of a wall section according to the present invention.

FIG. 9 is a sectional view of a ninth embodiment of a wall section according to the present invention.

FIG. 10 is a sectional view of a tenth embodiment of a wall section according to the present invention.

FIG. 11 is a top plan view of a cup having a sidewall section according to the present invention.

FIG. 12 is a sectional view of the cup of FIG. 11, taken along line 12-12 in FIG. 11. The sectional views of FIGS. 1-9 of sidewall sections included in alternative embodiments of the cup of FIG. 12 are taken along line A-A in FIG. 12. These sectional views do not account for the curvature of the sidewall section of the cup.

FIG. 13 is an enlarged sectional view of the rim portion 13 of the cup of FIG. 12

FIG. 14 is an enlarged sectional view of a portion 14 of the bottom wall section of the cup of FIG. 12

FIG. 15 is a plan view of a wall component of an embodiment of another wall section according to the present invention.

FIG. 16 is a sectional view of the wall component of FIG. 15, taken along line 16-16 in FIG. 15.

FIG. 17 is a plan view of a wall section including the wall component of FIG. 15 combined with another such wall component disposed in opposition and oriented at an angle of ninety degrees thereto.

DETAILED DESCRIPTION

Referring to FIG. 1, a first embodiment of a wall section 10 according to the present invention includes a first plastic wall component 11 and an opposing second plastic wall component 12. The first wall component 11 is injection molded and includes two or more ribs 15 and a web 16 therebetween. The ribs 15 are wider than the thickness of the web 16. The second wall component 12 does not include ribs and is either injection molded or thermoformed. The ribs 15 of the first wall component 11 contact the second wall component 12, and the web 16 of the first wall component 11 is apart from the second wall component 12.

Referring to FIG. 2, a second embodiment of a wall section 20 according to the present invention includes a first plastic wall component 21 and an opposing second wall component 22. The first wall component 21 is injection molded and includes two or more ribs 25 and a web 26 therebetween, wherein the ribs 25 are wider than the thickness of the web 26. The second plastic wall component 22 is also injection molded and includes two or more ribs 27 and a web 28 therebetween, wherein the ribs 27 are wider than the thickness of the web 28. The ribs 25 of the first wall component 21 contact the web 28 of the second wall component 22, and the web 26 of the first wall component 21 is apart from the web 28 of the second wall component 22. Also, the ribs 27 of the second wall component 22 contact the web 26 of the first wall component 21.

Referring to FIG. 3, a third embodiment of a wall section 30 according to the present invention includes a first plastic wall component 31 and an opposing second wall component 32. The first wall component 31 is injection molded and includes two or more ribs 35 and a web 36 therebetween, wherein the ribs 35 are wider than the thickness of

the web 36. The second plastic wall component 32 is also injection molded and includes two or more ribs 37 and a web 38 therebetween, wherein the ribs 37 are wider than the thickness of the web 38. The ribs 35 of the first wall component 21 contact the ribs 37 of the second wall component 32, and the web 36 of the first wall component 31 is apart from the web 38 of the second wall component 32.

Referring to FIG. 4, a fourth embodiment of a wall section 40 according to the present invention includes a first plastic wall component 41 and an opposing second wall component 42. The first wall component 41 is injection molded and includes two or more ribs 43, 43' and a web 44 therebetween, wherein the ribs 43, 43' are wider than the thickness of the web 44. The second plastic wall component 42 is also injection molded and includes two or more ribs 45, 45' and a web 46 therebetween, wherein the ribs 45, 45' are wider than the thickness of the web 46. The ribs 43 of the first wall component 41 contact the web 46 of the second wall component 42, and the web 44 of the first wall component 41 is apart from the web 46 of the second wall component 42. Also, the ribs 45 of the second wall component 42 contact the web 44 of the first wall component 41.

At least one pair of ribs 43 of the first wall component 41 are spaced apart by slightly more than the width of a rib 45' of the second wall component 42 to define a notch 47 in which the rib 45' of the second wall component 42 is disposed without contacting the web 44 of the first wall component 41; and at least one pair of ribs 45 of the second wall component 42 are spaced apart by slightly more than the width of a rib 43' of the first wall component 41 to define a notch 48 in which the rib 43' of the first wall component 41 is disposed without contacting the web 46 of the second wall component 42. Such disposition of the ribs 43', 45' in the respective notches 47, 48

prevents movement of the first wall component 41 with respect to the second wall component 42 and thereby maintains an optimum stiffness of the wall section 40.

Referring to FIG. 5, a fourth embodiment of a wall section 50 according to the present invention includes a first plastic wall component 51 and an opposing second wall component 52. The first wall component 51 is injection molded and includes two or more ribs 53 and a web 54 therebetween, wherein the ribs 55, are wider than the thickness of the web 54. The second plastic wall component 52 is also injection molded and includes two or more ribs 55 and a web 56 therebetween, wherein the ribs 55 are wider than the thickness of the web 56. The ribs 53 of the first wall component 51 contact the web 56 of the second wall component 52, and the web 54 of the first wall component 51 is apart from the web 56 of the second wall component 52.

At least one pair of ribs 55 of the second wall component 52 are spaced apart by slightly more than the width of a rib 53 of the first wall component 51 to define a notch 58 in which a rib 53 of the first wall component 51 is disposed. Such disposition of the ribs 53 in the notches 58 prevents movement of the first wall component 51 with respect to the second wall component 52 and thereby maintains an optimum stiffness of the wall section 50.

Referring to FIG. 6, a sixth embodiment of a wall section 60 according to the present invention includes a first plastic wall component 61 and an opposing second wall component 62. The first wall component 61 is injection molded and includes two or more ribs 63 and a web 64 therebetween, wherein the ribs 65, are wider than the thickness of the web 64. The second plastic wall component 62 is also injection molded and includes two or more ribs 65 and a web 66 therebetween, wherein the ribs 65 are wider than the

thickness of the web 66. The ribs 63 of the first wall component 61 contact the web 66 of the second wall component 62, and the web 64 of the first wall component 61 is apart from the web 66 of the second wall component 62. Also, the ribs 65 of the second wall component 62 contact the web 64 of the first wall component 61.

At least one pair of ribs 65 of the second wall component 62 are spaced apart by slightly more than the width of a rib 63 of the first wall component 61 to define a notch 68 in which a rib 63 of the first wall component 61 is disposed. Such disposition of the ribs 63 in the notches 68 prevents movement of the first wall component 61 with respect to the second wall component 62 and thereby maintains an optimum stiffness of the wall section 60.

Referring to FIG. 6A, in a preferred variation of the embodiments of FIGS. 4, 5 and 6, in which a pair of ribs 5a, 5b of one wall component 2 are spaced apart by slightly more than the width of a rib 3 of the other wall component 1 to define a notch 8 in which the rib 3 of the other component 1 is disposed, one rib 5b contacts the web 4 of the other wall component 1, and the other rib 5a does not contact the web 4. In alternative embodiment including this variation, the pair of ribs 5a, 5b of the one wall component 2 are spaced apart by approximately the width of the rib 3 of the other wall component 1 to define the notch 8 in which the rib 3 of the other component 1 is disposed. In preferred embodiments including this variation, the rib 3 of the other wall component 1 and the notch 8 are so contoured that the rib 3 of the other wall component 1 does not fully occupy the notch 8. This variation provides stability similar to the stability provided by the embodiments of FIGS. 4, 5 and 6, without requiring as much material to manufacture the product.

Referring to FIG. 7, a seventh embodiment of a wall section 70 according to the present invention includes a first plastic wall component 71 and an opposing second plastic wall component 72. The first wall component 71 is injection molded and includes two or more ribs 73 and a web 74 therebetween. The ribs 73 are wider than the thickness of the web 74. The second wall component 72 does not include ribs and is either injection molded or thermoformed. The ribs 73 of the first wall component 71 contact the second wall component 72 via a thin-material layer 77, such as a product label, and the web 74 of the first wall component 71 is apart from the second wall component 72. When the layer 77 includes a label, at least one of the wall components 71, 72 is transparent so that the label can be viewed.

Referring to FIG. 8, an eighth embodiment of a wall section 80 according to the present invention includes a first plastic wall component 81 and an opposing second wall component 82. The first wall component 81 is injection molded and includes two or more ribs 83 and a web 84 therebetween, wherein the ribs 83 are wider than the thickness of the web 84. The second plastic wall component 82 is also injection molded and includes two or more ribs 85 and a web 86 therebetween, wherein the ribs 85 are wider than the thickness of the web 86. The ribs 83 of the first wall component 81 contact the ribs 85 of the second wall component 82 via a thin-material layer 87, such as a product label; and the web 84 of the first wall component 81 is apart from the web 86 of the second wall component 82. When the layer 87 includes a label, at least one of the wall components 81, 82 is transparent so that the label can be viewed.

Referring to FIG. 9, a ninth embodiment of a wall section 90 according to the present invention includes a first plastic wall component 91 and an opposing second wall

component 92. The first wall component 91 is injection molded and includes two or more ribs 93 and a web 94 therebetween, wherein the ribs 93 are wider than the thickness of the web 94. The second plastic wall component 92 is also injection molded and includes two or more ribs 95 and a web 96 therebetween, wherein the ribs 95 are wider than the thickness of the web 96. The ribs 93 of the first wall component 91 contact the web 96 of the second wall component 92, and the web 94 of the first wall component 91 is apart from the web 96 of the second wall component 92. Also, the ribs 95 of the second wall component 92 contact the web 94 of the first wall component 91.

The wall section 90 further includes a first exterior layer 97 laminated to the exterior of the first wall component 91 and a second exterior layer 98 laminated to the exterior of the second wall component 92. The desired characteristics of material in the respective wall components 91, 92 and exterior layers 97, 98 are selected from among moisture impervious, gas impervious and aroma impervious. The respective exterior layers 97, 98 are either injection molded or thermoformed. When the exterior layers 97, 98 are thermoformed they preferably are fabricated before fabrication of the respective laminated injection-molded wall component 91, 92 and disposed in the mold when the respective laminated wall component 91, 92 is injection molded. When the exterior layers 97, 98 are injection molded they preferably are fabricated after fabrication of the respective laminated injection-molded wall component 91, 92, and the respective laminated wall component 91, 92 is included in the mold in which the exterior layer 97, 98 is injection molded.

Referring to FIG. 10, a tenth embodiment of a wall section 100 according to the present invention includes a first plastic wall component 101, an opposing second plastic

wall component 102 and an opposing third wall component 103. The first wall component 101 is injection molded and includes two or more ribs 105 and a web 106 therebetween, wherein the ribs 105 are wider than the thickness of the web 106. The second plastic wall component 102 is also injection molded and includes a first set of two or more ribs 107 and a web 108 therebetween on a first side opposing the first wall component 101, wherein the ribs 107 are wider than the thickness of the web 108. The second plastic wall component 102 further includes a second set of two or more ribs 109 and a web 110 therebetween on a second side opposing the third wall component 103, wherein the ribs 109 are wider than the thickness of the web 110. The third plastic wall component 103 is also injection molded and includes two or more ribs 112 and a web 113 therebetween, wherein the ribs 112 are wider than the thickness of the web 113.

The ribs 105 of the first wall component 101 contact the web 108 on the first side of the second wall component 102, and the web 106 of the first wall component 101 is apart from the web 108 on the first side of the second wall component 102. Also, the ribs 107 on the first side of the second wall component 102 contact the web 106 of the first wall component 101. The ribs 112 of the third wall component 103 contact the web 110 on the second side of the second wall component 102, and the web 113 of the third wall component 103 is apart from the web 110 on the second side of the second wall component 102. Also, the ribs 109 on the second side of the second wall component 102 contact the web 113 of the third wall component 103.

Referring to FIGS. 11 through 14, alternative embodiments of a cup 120 according to the present invention include a sidewall section 121 embodied as described with reference to FIGS. 1 through 9. The cup 120 also includes a base wall section 122

and a rim section 123. In some of these embodiments, the cup 120 is fabricated by nesting an inner cup component 125 within an outer cup component 126. Each cup component 125, 126 includes a sidewall component 128, 128' a base wall component 129 and a rim component 130, 130'. The cup components 125, 126 are fabricated apart from each other. The sidewall section 121 of the cup 120 according to one of such alternative embodiments is assembled by nesting the inner cup component 125 within the outer cup component 126 to thereby combine the sidewall component 128 of the inner cup component 125 with the sidewall component 128' of the outer cup component 126. The inner cup component 125 is forcibly nested into the outer cup component 126 so that the rim component 130 of the inner cup component 125 becomes attached to the rim component 130' of the outer cup component 126 to thereby form a coherent cup.

The ribs on the sidewall components 128, 128' of the respective cup components 125, 126 are formed in mold-cavity channels that enhance molten plastic material flow during injection molding of such sidewall components 128, 128'. Such mold-cavity channels reduce injection pressure and mold clamping requirements. In some embodiments, the cup components 125, 126 are fabricated by the methods described in European Patent Application Publication EP 1 174 238 A1 and/or the patent publications cited therein and as further described in United States Patent Application No. 10/050,434 filed January 15, 2002.

The respective rims components 130, 130' of the different cup components 125, 126 are so shaped, such as shown in FIG. 13, that when the cup components 125, 126 are forcibly nested together the respective rim components 130, 130' become attached to one another to thereby make the cup coherent. The rim component 130 of the inner cup

component 125 may be fabricated by the method described in United States Patent Application No. 10/283,979 filed October 30, 2002.

The base wall component 129, 129' of each cup component 125, 126 also includes ribs 132, 132', as shown in FIG. 14, that are formed during injection molding of the respective cup components 125, 126. Accordingly, the cup 120 also includes a base wall section 122 embodied as described with reference to FIGS. 1 through 9.

In another alternative embodiment (not shown), the cup includes the sidewall section described with reference to FIG. 10. Such a cup is fabricating by nesting an inner cup component, an intermediate cup component and an outer cup component. In other respects such a cup has the same features as the cup described above with reference to FIGS. 11 through 14.

In some of such nested-cup-component embodiments and in other embodiments, in which the various wall sections of FIGS. 1 through 10 are not included in a cup, the product is made coherent by attaching at least one of the ribs of the one wall component to the other wall component at the place of contact with the other wall component. Preferably, more than one portion of the ribs are so attached and such attachment is accomplished by ultrasonic welding.

In another embodiment of a wall section according to the present invention, two injection molded plastic wall components 140 having two or more ribs 141 and a web 142 therebetween, as shown in FIGS. 15 and 16 are oriented at ninety degrees to one another and combined in opposition to each other with the ribs 141 of one wall component contacting the ribs 141 of the other wall component to form a wall section 144 as shown in FIG. 17, in which the ribs of one wall component 140 are aligned at a

ninety-degree angle to the ribs of the other wall component 140. The ribs 141 are wider than the thickness of the web 142. The web 142 of one wall component 140 is apart from the web 142 of the other wall component 140. In this embodiment the ribs 141 include indentations 146 at positions where the ribs 141 of one wall component contact the ribs 141 of the other wall component. Preferably, more than one portion of the ribs 141 of one wall component are attached by ultrasonic welding to the ribs of the other wall component at the places on contact therewith.

In alternative embodiments, the wall components 140 are so oriented with respect to one another that the ribs of one wall component 140 are aligned at other than a ninety-degree angle to the ribs of the other wall component 140.

In some embodiments, the wall section shown in FIGS. 15, 16 and 17 is a portion of a more extensive wall section of a product.

The wall section of the present invention has an enhanced thermal insulation characteristic in relation to a solid wall section of comparable thickness and material. When such a wall section is included in the sidewall section and/or the base wall section of a cup, this characteristic reduces the formation of moisture on the exterior of the cup when the cup contains a chilled beverage, and prevents the outer surface of cup from becoming too hot to hold when the cup contains a hot beverage.

The wall section of the present invention can be an arbitrarily small portion of a more extensive wall section of a product.

The desired characteristics of material in the respective wall components are selected from among moisture impervious, gas impervious and aroma impervious.

Additional embodiments of the present invention (not shown) include all different

combinations of the features described herein that are not incompatible with one another.

The benefits specifically stated herein do not necessarily apply to every conceivable embodiment of the present invention. Further, such stated benefits of the present invention are only examples and should not be construed as the only benefits of the present invention.

While the above description contains many specificities, these specificities are not to be construed as limitations on the scope of the present invention, but rather as examples of the preferred embodiments described herein. Other variations are possible and the scope of the present invention should be determined not by the embodiments described herein but rather by the claims and their legal equivalents. The claims require no implicit limitations. Each claim is to be construed explicitly as stated, or by its legal equivalent.